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BOTANY.—*Mosses collected in Brazil and Argentina by J. N. Rose in 1915.*[1]

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The mosses reported upon in the present paper are part of a large botanical collection made in Brazil and Argentina in 1915, upon an expedition conducted by Dr. J. N. Rose under the auspices of the Carnegie Institution of Washington and the New York Botanical Garden, the principal object of the exploration having been to collect cacti. Dr. Rose was accompanied by Paul G. Russell, detailed by the U. S. National Museum as assistant. The mosses listed are in the U. S. National Herbarium and the herbarium of the New York Botanical Garden.

SPHAGNUM MAGELLANICUM Brid.

Vicinity of Itatiaya, Brazil, July 26–30 (*20486*). This species, largely under the name of *S. medium*, is known from Alaska southward, also from Europe, Asia, and Africa.

SPHAGNUM SUBSECUNDUM Nees

Locality and date of preceding (*20508*). Largely known as *S. platyphyllum*, and of about as wide distribution as the preceding. (I am indebted to Dr. A. LeRoy Andrews for the determination of these Sphagnums.)

DITRICHUM RUFESCENS Hampe

Locality and date of preceding (*20544*). Not before credited to Brazil, I believe, but found on the west coast southward to Chile.

CERATODON STENOCARPUS Br. & Sch.

Locality and date of preceding (*20527*, *20544*). Common in tropical regions of the Old World also.

[1] Received September 3, 1930.

AONGSTROEMIA VAGINATA (Hook.) C. M.

Locality and date of preceding (*20449a*). No. 60 of E. Ule's mosses of Brazil, called *A. julaceo-divaricata* C. M., does not seem to be distinct from this species.

DICRANELLA EXIGUA (Schwaegr.) Mitt.

Itacurussa, State of Rio de Janeiro, Brazil, July 24 (*20423, 20426*).

DICRANELLA GUILLEMINIANA (Mont.) Hampe

Vicinity of Itatiaya, Brazil, July 26–30 (*20576*).

DICRANELLA HILARIANA (Mont.) Mitt.

Vicinity of Bahia, Brazil, May 29 (*19689*). Monte Serrat, vicinity of Itatiaya, Brazil, July 26–30 (*20443, 20446*). Near Milo Pecanna, State of Rio de Janeiro, Brazil, Aug. 9 (*20734*); very poor specimens but probably belonging here. This species occurs commonly from the southern United States to southern Brazil and has been described under a great variety of names.

DICRANELLA PABSTIANA (C. M.) Mitt.

On Corcovado, Rio de Janeiro, Brazil, July 12; marked "h."

DICRANELLA SUBSULCATA Hampe

Vicinity of Itatiaya, Brazil, July 26–30 (*20578; 20450*, immature but probably belonging here). Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20629*).

CAMPYLOPODIUM PUSILLUM (Schpr.) Williams

Vicinity of Itatiaya, Brazil, July 26–30 (20545a). Ule's no. 102 from this region, called *C. itatiaiense*, does not seem to me distinct.

HOLOMITRIUM ARBOREUM Mitt.

Vicinity of Toca de Onca, Brazil, June 27–29 (*20122*). Vicinity of Itatiaya, Brazil, July 26–30 (*20548*).

HOLOMITRIUM CRISPULUM Mart.

Forests of Jabaquara, Brazil, Aug. 15 (*20860, 20864*).

HOLOMITRIUM OLFERSIANUM Hsch.

Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20391*).

CAMPYLOPUS ARCTOCARPUS (Hsch.) Mitt.

Vicinity of Itatiaya, Brazil, July 26–30 (*20509*).

CAMPYLOPUS DETONSUS (Hampe) Par.

Vicinity of Bahia, Brazil, May 30 (*19696*). Sterile.

CAMPYLOPUS INTROFLEXUS (Hedw.) Mitt.

Vicinity of Itatiaya, Brazil, July 26–30 (*20474*).

CAMPYLOPUS PENICILLATUS (Hsch.) Jaeg.

Locality and date of preceding (*20434*).

CAMPYLOPUS SUBARCTOCARPUS (Hampe) Jaeg.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20811*). On Papagaya, Rio de Janeiro, Brazil, Aug. 1 (*20698b*).

CAMPYLOPUS SP.?

Near Santos, Brazil, Sept. 20 (*21111*). Sterile.

CAMPYLOPUS SP.

Vicinity of Itatiaya, Brazil, July 26–30 (*20548a*). Sterile.

PILOPOGON SUBJULACEUS Hampe

Vicinity of Itatiaya, Brazil, July 26–30 (*20545*, *20477a*).

LEUCOBRYUM ALBICANS (Schwaegr.) Lindb.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20858*).

OCTOBLEPHARUM ALBIDUM (L.) Hedw.

Vicinity of Bahia, Brazil, May 26 (*19633*, *19642*). Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20388*).

FISSIDENS OBTUSATUS Hampe

Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20389*).

FISSIDENS PSEUDOBRYOIDES Schlph.

Vicinity of Bahia, Brazil, May 30 (*19704*) and June 3 (*20139a*). Sao Miguel, State of Bahia, Brazil, June 26 (*20055*). This determination as *F. pseudobryoides* appears to be correct, but on further study it would seem that the species is not sufficiently distinct from the older *F. Kegelianus*.

CALYMPERES RICHARDI C. M.

Vicinity of Bahia, Brazil, May 26 (*19632*).

HYMENOSTOMUM MICACEUM (Schlecht.) Hampe

Vicinity of Bom Finn, Bahia, Brazil, June 8, 9 (*19830*). Vicinity of Cabo Frio, Rio de Janeiro, Brazil, Aug. 8 (*20730*). This species is distinguished by having the costa quite papillose on the upper surface from near the apex about two-thirds of the way down, the back of the leaf and costa being smooth or slightly papillose, and the upper surface of leaf mostly mamillose. Known only from Brazil until collected at Frederiksted, St. Croix, West Indies, by Rose, Fitch and Russell, in Feb. 1913, no. *4448*.

TIMMIELLA UMBROSA (C. M.) Broth.

Near Cassaffousth, Córdoba, Argentina, Sept. 9 (*21068*).

DIDYMODON SCHIMPERI (Mont.) Broth.

Portrerillos, Mendoza, Argentina, Sept. 2 (*20998*). Apparently not known previously outside of Chile.

TORTELLA CAESPITOSA (Schwaegr.) Limpr.

Vicinity of Toca de Onca, Bahia, Brazil, June 27–29 (*20118*). Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20386, 20387, 20392*). Monte Serrat, vicinity of Itatiaya, Brazil, July 26–30 (*20444*). Near Iguaba Grande, Rio de Janeiro, Brazil, Aug. 7–9 (*20715*). Petropolis, Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20829*). Near Cassaffousth, Córdoba, Argentina, Sept. 9 (*21066*). On Corcovado, Rio de Janeiro, Brazil, July 19, marked "*a*."

HYOPHILA MICROCARPA (Besch.) Broth.

Salgada, State of Bahia, Brazil, June 1 (*19712*). Queimadas, Bahia, Brazil, June 9–17 (*19861, 19882*). Vicinity of Machado Portello, Bahia, Brazil, June 19–23 (*19934, 19997*).

HYOPHILA TORTULA (Schwaegr.) Hampe

State of Bahia, Brazil, May 31 (*19707*). Alagoinhas, State of Bahia, Brazil, June 12 (*19883*).

BARBULA UNCINICOMA C. M.

Near Cassaffousth, Córdoba, Argentina, Sept. 9 (*21067*).

DESMATODON STOMATODONTUS (Card.) Williams

Vicinity of Bahia, Brazil, May 25 (*19620*), mixed with *Tortula agraria* Sw. Same locality, June 15 (*19892*).

TORTULA AGRARIA Sw.

Vicinity of Bahia, Brazil, May 25 (*19620a*).

Tortula perrufula (C. M.) Williams, comb. nov.

Barbula perrufula C. M. Hedwigia **36**: 103. 1897. This seems to belong rather to *Tortula*, inasmuch as there is no stereid band on the upper side of the costa. It has leaf margins of a double thickness of cells, 32 twisted teeth from a rather high basal membrane, and an annulus of 2 or 3 rows of cells.

GLYPHOMITRIUM BALANSAE (Besch.) Broth.

Near Cassaffousth, Córdoba, Argentina, Sept. 9 (*21064*). Here must be referred *G. brevifolium* C. M., which apparently is not distinct in any way from *G. Balansae*.

ZYGODON SUBDENTICULATUS Hampe

Vicinity of Itatiaya, Brazil, July 26–30 (*20512*). Not previously credited to Brazil.

MACROMITRIUM FRAGILE Mitt.

On orchids in market, Bahia, Brazil, May 26 (*19643*).

MACROMITRIUM MUCRONIFOLIUM (Hook. & Grev.) Schwaegr.

Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20380*). Near Santos, Brazil, Sept. 20 (*21115*).

SCHLOTHEIMIA NITIDA Schwaegr.

Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20632*).

SCHLOTHEIMIA RUGIFOLIA (Hook.) Brid.

Vicinity of Toca de Onca, Bahia, Brazil, June 27–29 (*20122a*). North of Caldeirao, State of Bahia, Brazil, June 30 (*20134*).

TETRAPLODON ITATIAIAE C. M.

Vicinity of Itatiaya, Brazil, July 26–30 (*20475*).

FUNARIA APIAHYENSIS (C. M.) Broth.

Vicinity of Itatiaya, Brazil, July 26–30 (*20558*, mixed with *Psilopilum Ulei*).

FUNARIA CALVESCENS Schwaegr.

Vicinity of Itatiaya, Brazil, July 26–30 (*20451*, *20466*, *20467*, *20468*, *20595*).

FUNARIA HYGROMETRICA (L.) Sibth.

Vicinity of Buenos Aires, Argentina, Aug. 28 (*20960*).

FUNARIA SERRICOLA (C. M.) Broth.

Vicinity of Itatiaya, Brazil, July 26–30 (*20465*). Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20626*).

MIELICHHOFERIA MANCA (C. M.) Broth.

Vicinity of Itatiaya, Brazil, July 26–30 (*20539*, *20546*).

BRYUM ARGENTEUM L.

Aramary, State of Bahia, Brazil, May 31 (*19708*). Sao Miguel, State of Bahia, Brazil, June 26 (*20054*). Vicinity of Toca de Onca, Bahia, Brazil, June 27–29 (*20121*). Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20355*). Vicinity of Itatiaya, Brazil, July 26–30 (*20547*, mixed with a sterile *Campylopus*).

BRYUM CRUGERI Hampe; C. M.

Vicinity of Toca de Onca, Bahia, Brazil, June 27–29 (*20119*). Near Santos, Brazil, Sept. 20 (*21112*). Apparently not before reported for Brazil.

BRYUM DENSIFOLIUM Brid.

Near Santos, Brazil, Sept. 20 (*21113*). Vicinity of Toca de Onca, Bahia, Brazil, June 27–29 (*20120*). Alta Boa Vista, vicinity of Rio de Janeiro, Brazil, July 18 (20306).

BRYUM GARDNERI Mitt.

Near Santos, Brazil, Sept. 20 (*21114*).

RHODOBRYUM GRANDIFOLIUM (Tayl.) Par.

Vicinity of Itatiaya, Brazil, July 26–30 (20575).

MNIUM LIGULATUM C. M.

Vicinity of Itatiaya, Brazil, July 26–30 (*20577*). Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20776, 20806*).

RHIZOGONIUM SPINIFORME (L.) Bruch

On Papagaya, Rio de Janeiro, Brazil, Aug. 1 (*20647*). Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20810, 20822*).

PHILONOTIS CURVATA (Hampe) Jaeg.

Nazareth, vicinity of Bahia, Brazil, June 30 (*20139*).

PHILONOTIS UNCINATA (Schwaegr.) Brid.

Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20637*).

OLIGOTRICHUM RIEDELIANUM (Mont.) Mitt.

Vicinity of Itatiaya, Brazil, July 26–30 (*20449, 20556a*).

PSILOPILUM ULEI Broth.

Vicinity of Itatiaya, Brazil, July 26–30 (*20465a, 20555, 20558a*).

POLYTRICHADELPHUS UMBROSUS Mitt.

On Corcovado, Rio de Janeiro, Brazil, July 11, marked "*f.*"

POGONATUM ABBREVIATUM Mitt.

Monte Serrat, vicinity of Itatiaya, Brazil, July 26–30 (*20447*).

POGONATUM GARDNERI (C. M.) Mitt.

Vicinity of Itatiaya, Brazil, July 26–30 (*20556*).

POLYTRICHUM ANGUSTIFOLIUM Mitt.

Vicinity of Rio de Janeiro, Brazil, July 26–30 (*20436*).

POLYTRICHUM ANTILLARUM Rich.

Vicinity of Rio de Janeiro, Brazil, July 26–30 (*20436a*). Vicinity of Itatiaya, Brazil, July 26–30 (*20448, 20452, 20530*, and "*k*"). Petropolis, Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (20827).

ERPODIUM CORONATUM (Hook. f. & Wils.) Mitt.

Vicinity of Machado Portello, Bahia, Brazil, June 19–23 (*19996*).

ERPODIUM GLAZIOVII Hampe

On Corcovado, Rio de Janeiro, Brazil, Aug. 17 (*20875*).

RHACOCARPUS HUMBOLDTII (Hook.) Lindb.

Vicinity of Itatiaya, Brazil, July 26–30 (*20508a*, *20521*).

ORTHOSTICHOPSIS TENUIS (C. M.) Broth.

On Corcovado, Rio de Janeiro, Brazil, July 11, marked "*j*."

SQUAMIDIUM NITIDUM (Sull.) Broth.

North of Caldeirao, State of Bahia, Brazil, June 30 (*20133a*).

LINDIGIA CAPILLACEA (Hornsch.) Hampe

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20781b*). No. 70 of E. Ule's Brazilian mosses, issued as *L. paupera* C. M., apparently an unpublished name, evidently belongs here.

LINDIGIA TRICHOMITRIA C. M.

Collected with the last preceding (*20781a*).

PHYLLOGONIUM IMMERSUM Mitt.

On Papagaya, Rio de Janeiro, Brazil, Aug. 5 (*20648*).

NECKERA ARGENTINICA Lor.

Tucumán, vicinity of Buenos Aires, Argentina, Aug. 29 (without number).

POROTRICHUM KORTHALSIANUM (Dz. & Mb.) Mitt.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20821*). Previously collected only in Venezuela and Surinam.

POROTHAMNIUM STRIATUM (Mitt.) Fleisch.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20772*).

STEREOPHYLLUM LEUCOSTEGUM (Brid.) Mitt.

Rio Branco, State of Bahia, Brazil, June 12 (*19877*).

FABRONIA LORENTZII C. M.

Vicinity of Córdoba, Argentina, Sept. 8 (*21039*).

FABRONIA POLYCARPA Hook.

Bahia, Brazil, May 28 (*19660*). Vinicity of Bom Finn, Bahia, Brazil, June 8, 9 (*19829*, *19831*). On Corcovado, Rio de Janeiro, Brazil, Aug. 17 (*20875*, *20876*).

HELICODONTIUM TENUIROSTRE Schwaegr.

Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20631*).

HOOKERIOPSIS BEYRICHIANA (Hampe) Broth.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20808a*).

HOOKERIOPSIS GLAZIOVII (Hampe) Jaeg.

Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20633*).

LEPIDOPILUM SUBULATUM Mitt.

Organ Mountains, Rio de Janiero, Brazil, Aug. 12 (*20781*).

HYPOPTERYGIUM MONOICUM Hampe

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20775*).

HELICOPHYLLUM TORQUATUM (Hook.) Brid.

Itumirim, State of Bahia, Brazil, June 5 (*19815*).

HAPLOCLADIUM RIOGRANDENSE C. M.

Jardim Botanico, Rio de Janeiro, Brazil, Aug. 10 (*20745*).

THUIDIUM DELICATULUM (L.) Mitt.

Vicinity of Itatiaya, Brazil, July 26–30 (*20472a, 20557*). *T. brasiliense* Mitt. is near this species, but has larger leaf cells and larger, higher papillae.

THUIDIUM PSEUDORECOGNITUM (Hampe) Broth.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 20 (*20772a*). This species appears to come nearest to *T. Antillarum*, from which it is distinguished by the cells of the branch leaves having several papillae to each cell-surface instead of only one. The inner perichaetial leaves are long-ciliate. Small, often scarcely elongate cells extend almost to the leaf-base in both stem and branch leaves, and in the branch leaves the costa is very prominent and rough on the back.

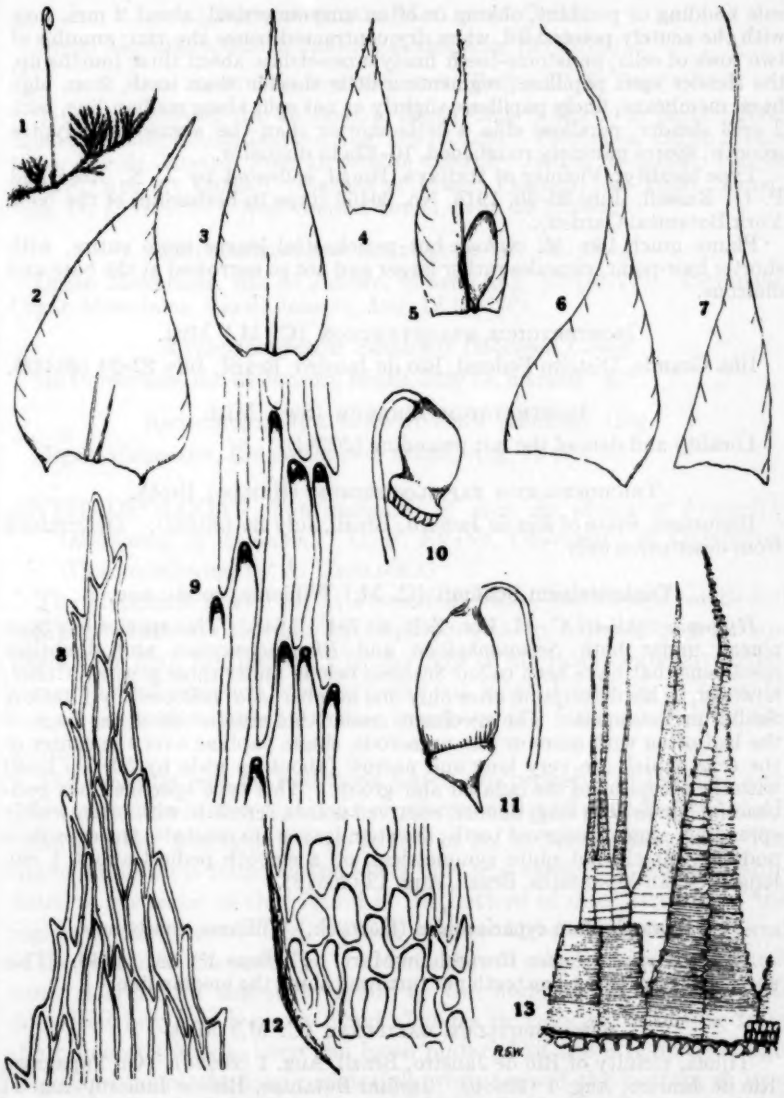
AMBLYSTEGIUM VARIUM (Hedw.) Lindb.

La Plata, Argentina, Sept. 14 (*21106*). E. Ule's no. 73, *A. pulchellum* C. M., apparently an unpublished name, seems to belong here.

Microthamnium Russellii R. S. Williams, sp. nov.

Figs. 1–13

Dioicous, ♂ flowers, about midway on the branches, rather narrowly ovate-acute, a little over 1 mm. high, the inner perigonial leaves with ovate base rather gradually narrowed to a lanceolate, serrulate point, enclosing 5–6 antheridia about .33 mm. long and a few slender paraphyses; plants growing in pale yellowish-brown mats with more or less trailing and branching stems mostly 3 or 4 cm. long, bearing scattered clusters of radicles and rather short, mostly .5–1 cm. long, often divided branches hardly complanate and tapering to apex; leaves not complanate, those of the upper stem shortly bicostate, about 1.5 mm. long, from a broadly ovate base gradually tapering to a very acute point, the borders more or less recurved and serrulate to near base; leaves of lower stem mostly shorter and broader than above and ecostate and entire; branch-leaves narrower and smaller than upper stem leaves, serrulate and bicostate except the much smaller apical leaves, these ecostate; cells of the branch-leaves mostly distinctly papillose on back at upper end, the median about 5μ wide by 35–50μ long, the alar cells sometimes forming a rather distinct group of wider, shorter cells; seta 2–2.5 cm. long; inner perichaetial leaves longer than stem-leaves, ecostate, from an ovate or lanceolate base gradually narrowed to a very slender, entire or nearly entire point; cap-



Microthamnium Russellii: 1. Plant about natural size. 2. Middle stem-leaf ×35. 3. Middle branch-leaf ×35. 4. Terminal branch-leaf ×35. 5. Perigonial leaf, antheridium and paraphyses ×35. 6 and 7. Inner perichaetial leaves ×35. 8. Apex of branch leaf ×210. 9. Median cells of leaf ×210. 10. Dried deoperculate capsule ×14. 11. Moistened capsule ×14. 12. Group of alar cells from upper stem leaf ×210. 13. Part of peristome and annulus ×150.

sule nodding or pendant, oblong or often unsymmetrical, about 2 mm. long with the acutely pointed lid, when dry contracted below the rim; annulus of two rows of cells; peristome-teeth finely cross-striate about three fourths up, the slender apex papillose; segments a little shorter than teeth, from high basal membrane, finely papillose, slightly or not split along median line, with 2 or 3 slender, papillose cilia a little shorter than the segments; calyptra smooth; spores minutely roughened, 10–12μ in diameter.

Type locality: Vicinity of Itatiaya, Brazil, collected by J. N. Rose and P. G. Russell, July 26–30, 1915, No. 20469 (type in herbarium of the New York Botanical Garden).

Plants much like *M. reptans* but perichaetial leaves more entire, with shorter hair-point, capsules rather larger and not so narrowed at the base and dioicous.

ISOPTERYGIUM BRACHYNEURON (C. M.) Mitt.

Ilha Grande, Distrito Federal, Rio de Janeiro, Brazil, July 22–24 (*20382*).

ISOPTERYGIUM TENERUM (Sw.) Mitt.

Locality and date of the last preceding (*20384*).

TRICHOSTELEUM PAPILLOSISSIMUM (Hampe) Broth.

Itacurussa, State of Rio de Janeiro, Brazil, July 24 (*20425*). Determined from description only.

Trichosteleum Schlimii (C. M.) Williams, comb. nov.

Hypnum Schlimii C. M. Bot. Zeit. 6: 781. 1848. This species has been placed under both *Sematophyllum* and *Rhaphidostegium* and doubtless specimens that have been called *Schlimii* belong under those genera; Müller, however, in his description cites only one number, *356*, collected by Funck & Schlim in Venezuela. The specimens under this number show the back of the leaf often with more or less numerous, single papillae over the center of the cells, which are very long and narrow (about 4μ wide by 50–60μ long) with the exception of the inflated alar group. This type specimen has perichaetial leaves with long, slender, recurved points, serrulate with often widely spreading, almost recurved teeth; the stem leaves are ecostate; the capsule is nodding, mostly not quite symmetrical, on a smooth pedicel about 1 cm. long. Organ Mountains, Brazil, Aug. 12 (*20812*).

Sematophyllum cyparissoides (Hornsch.) Williams, comb. nov.

Hypnum cyparissoides Hornsch. in Mart. Fl. Bras 1^2: 88. 1840. This species has the peristome teeth not furrowed along the median line.

SEMATOPHYLLUM GALIPENSE (C. M.) Mitt.

Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20625*). On Papagaya, Rio de Janeiro, Aug. 1 (*20650*). Jardim Botanico, Rio de Janeiro, Aug. 11 (*20836*). On Corcovado, Rio de Janeiro, Aug. 19, marked "*c.*" Garden of Museo Paulista, São Paulo, Brazil, Aug. 14, 15 (20842). Near Santos, Brazil, Sept. 20 (21110).

SEMATOPHYLLUM MAILUSIAE C. M.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20780*).

SEMATOPHYLLUM SUBPINNATUM (Brid.) E. G. Britt.

Tijuca, vicinity of Rio de Janeiro, Brazil, Aug. 1 (*20630* in part). Near Iguaba Grande, Rio de Janeiro, Aug. 7–9 (*20749*). Petropolis, Organ Mountains, Rio de Janeiro, Aug. 12 (20826, 20831). Jardim Botanico, Rio de Janeiro, Aug. 11 (*20835*). Garden of Museo Paulista, Sao Paulo, Brazil, Aug. 14, 15 (*20869*). Near Santos, Brazil, Sept. 20 (*20899*).

RHYNCHOSTEGIUM BESKEANUM (C. M.) Jaeg.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20777*). Petropolis, Organ Mountains, Rio de Janeiro, Aug. 12 (*20828*).

RHYNCHOSTEGIUM SELLOWII (Hornsch.) Jaeg.

On Corcovado, Rio de Janeiro, Brazil, July 14, marked "*d.*"

RHYNCHOSTEGIUM SUBROTUNDUM (Hampe) Jaeg.

Organ Mountains, Rio de Janeiro, Brazil, Aug. 12 (*20778*).

ANTHROPOLOGY.—*The antiquity of man as shown at Frederick, Oklahoma: A criticism.*[1] O. F. EVANS, University of Oklahoma. (Communicated by A. HRDLIČKA)

The Holloman gravel pit at Frederick, Okla., has yielded fossils and artifacts which are thought by some persons to indicate a great antiquity for man in America. In the light of my rather extensive experience in that region, I wish to point out what I believe to be some serious mistakes which have been made in the interpretation of the evidence.

The deposits rest on Red Beds which are probably of Permian age. The lower four or five feet consists of consolidated cross-bedded sand, clean pebbles, and boulders up to five or six inches in diameter. The coarse material is found in the lower part and except for being consolidated is the same as that found in the bottom of most streams in the region at the present time. These streams have the coarser material at the bottom of the sand and boulder beds, not only because the streams come nearer and nearer to grade as the material in the bottom is deposited but also because rapid changes in velocity, resulting from the numerous floods, keep the loose material of the stream beds agitated and hence the larger materials work toward the bottom as in a miner's pan.

[1] Received September 25, 1930.

This cross-bedded sandstone and conglomerate represents the early normal period of the old stream's history. In the Frederick pit it is more tightly cemented than the material higher up because it lies at about the top of the ground-water level and has been subjected to more wetting and drying by the rising and falling of the ground-water table than has the material of the upper layers.

Above this old river bottom is a middle layer, ten to twelve feet thick, of water-deposited material, consisting of sand, gravel and small boulders. The materials are in great variety. Some can be recognized as having come from the Wichita mountains a few miles to the north, but much has the same source as other numerous gravel and sand deposits in that part of southwestern Oklahoma, west of the Wichita, whose source was somewhere to the west toward the Rocky mountains.

It contains in particular the same varieties of igneous rocks and schists that are found in other deposits all along the present North Fork of the Red River at elevations of about 70 to 80 feet above the present stream bed. These other deposits also contain numerous animal remains similar to those of the Holloman pit, such as tusks, thigh bones, etc., which on casual examination appear to be what are generally referred to as of Pleistocene age. Gravel deposits containing such animal remains, but of course varying as to the nature of the rock materials, are found lying 60 to 100 feet above the present stream beds along nearly all the streams in the whole of western Oklahoma.

This would seem to be fairly good evidence of a post-Pleistocene uplift over this region. All we can say at present as to the time of this uplift is that it occurred long enough ago so that the streams have since had time to cut down to their present level. Unfortunately there is so little known by geologists about the actual rate of erosion for any particular area that to try to fix the length of a period of time in years on any such basis is no better than a guess. Neither do we know the rate of the uplift nor how long it continued. Like most such uplifts it was probably gradual and any streams that may have been aggrading or in equilibrium, were slowly changed to degrading streams.

Above this layer of water-deposited sands and gravels is an upper layer of several feet of material that appears to be partly water- and partly wind-deposited, taking on more and more of the character of wind-deposited material higher up. The middle part of this layer contains some aggregates of calcareous material whose origin so far has not been satisfactorily explained.

The ridge on which the gravel pit is located extends to the northwest to about where Otter creek appears to have once joined the North Fork of Red River, and contains at several places stream gravels similar to those of the Holloman pit. A study of the region suggests very strongly to anyone familiar with the work of streams of Oklahoma and the southwest that the present lower course of the North Fork of the Red, a few miles west of Frederick, is in the course of a stream that committed piracy on the stream that laid down the gravels of the Holloman pit. If this is the case, the Holloman pit is in the bed of what was formerly the North Fork of the Red. We have no way of knowing how long ago this act of piracy was completed and any attempt to determine it from rate of erosion would be idle speculation, since we do not know how large a valley the more westerly stream had eroded before the piracy was committed, nor do we know anything about the rate of erosion in this particular area either before or after the piracy.

The coarse, water-deposited material of the middle layer above the old stream bed means a quickening of the stream velocity and this might easily have occurred at the time of the post-Pleistocene uplift which would have also been a favorable time for the committing of the piracy by the rapid cutting headward of the more westerly stream.

The lower part of the upper beds were apparently deposited in that period of the stream's history when the river had not completely left its old channel and was still depositing during periods of high water. The uppermost part is wind-deposited material dropped there after the channel no longer contained a running stream.

Arrowheads, metates and bones of Pleistocene animals, at least some of which have been identified by Hay as of Aftonian age, have been found in the middle layer and a few arrowheadlike artifacts have been found in the lower beds. So far no articulated skeletons have been found. The nearly complete carapace of a glyptodon was found and is now in the University of Oklahoma museum, but no part of its skeleton was found. This fact indicates some disturbance of the animal remains since they were first buried. A few of the Pleistocene bones show much wear as though they had been transported a considerable distance, but most of them show but little wear.

Metates are considered by anthropologists to have appeared rather late in the history of the human race, and the arrowheads found in the pit are also of a late type. In fact some of them look the same as those now frequently picked up on the surface in this region.

The presence of the bones of Pleistocene animals mixed with metates and arrowheads is apparently considered by Cook, Figgins and some others as prima facie evidence of the existence of man on the earth at the same time as the animals which furnished the bones. It seems to be a case of trying to apply to land deposits a line of reasoning which is excellent for marine deposits, but which does not apply at all in the case of stream deposits. With rocks of marine origin we are quite justified in assuming that the animal remains found in them are of the same age as the sediments and that bones and shells once deposited with sediments on the bottom of the ocean were not disturbed before consolidation. The general rule for marine deposits may be said to be continued stability after deposition.

However any geologist after a little thought on the subject will be convinced that, in general, stream deposits are unstable. Any stream deposit is subject to disturbance at any time as long as a stream continues to flow in the valley of the deposit.

This being the case the line of reasoning regarding the Holloman gravel pit and the remains found in it is evident.

1. It is a stream deposit.

2. As a stream deposit it was subject to disturbance at any time up to the time the stream left the valley.

3. There is no reliable evidence as to the time the stream which deposited the gravels left its valley, since calculations based on rate of erosion have no value.

4. The coarser material of the middle layer shows an increase of velocity must have occurred. This might have been at the time of the post-Pleistocene uplift, but not necessarily.

5. Since no articulated skeletons have been found in the pit it is probable that the skeletons have been disturbed since the original deposition. This disturbance may easily have been post-Pleistocene.

6. If there has been a disturbance, the finding of metates and arrowheads mixed with Pleistocene bones does not mean that the metates and arrowheads are of Pleistocene age. On the contrary the metates and arrowheads are just as good evidence of the age of the pit as are the bones.

7. Since anthropologists have good reason to believe that the kind of arrowheads and the metates found here are of rather recent age, we are not justified in saying that the deposit indicates great antiquity of man in the region.

The geological history of the pit may have been about as follows. Piracy was committed by the stream to the west soon after the post-Pleistocene uplift, thus causing the old stream to leave the bed in which the gravel pit is found. The surrounding region had been considerably eroded before this occurred. Soon after the uplift and at about the time the piracy occurred, when the waters of the old stream were at flood stage and flowing rapidly, a gravel deposit, a little farther up the stream than the present one, was undercut and redeposited. This contained the bones now found in the Holloman pit, while the arrow heads and metates were on the surface where they had been left a comparatively short time before, and all went into the river and were redeposited together in what is now the Holloman gravel pit.

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SCIENTIFIC NOTES AND NEWS

An aquarium section in the new reptile house at the National Zoological Park has been endowed by Maj. LEIGH ZERBEE, U. S. A., in memory of his wife, FRANCES BRINCKLE ZERBEE. Mrs. Zerbee was a great lover of aquaria, and the memorial is for the purpose of encouraging interest in home aquaria. The income of the endowment is to be used to keep stocked with interesting specimens this section of the new reptile house.

PAUL W. OMAN has been appointed by the Bureau of Entomology as a specialist in the order Homoptera, which includes principally the insects commonly known as leaf-hoppers. Mr. Oman, who studied these insects under Professor P. B. LAWSON at the University of Kansas, will take charge of the collection of Homoptera at the National Museum.

Dr. B. PRASHAD of the Zoological Survey of India at Calcutta recently examined the types of mollusks in the Lea Collection at the National Museum.

JOHN OLIVER LA GORCE was the guest of honor at a dinner given November 5 at the Willard Hotel by the trustees of the National Geographic Society in celebration of the twenty-fifth anniversary of his association with the organization.

G. A. COOPER has been appointed Assistant Curator in the Division of Stratigraphic Paleontology of the National Museum. For several years past, Dr. COOPER has been studying Paleozoic brachiopods at Yale University.

Obituary

FRANK JAMES KATZ, a member of the ACADEMY, died on August 21, 1930. He was born at New York City January 27, 1883, received the degree of bachelor of arts from the University of Wisconsin in 1905, and held a fellowship in the department of geology at the University of Chicago in 1906–07. He was on the staff of the U. S. Geological Survey from 1907 until 1925, when he became Chief Engineer of the Division of Mineral Resources and Statistics of the U. S. Bureau of Mines.

GEORGE MCLANE WOOD, editor of the United States Geological Survey from 1908 to 1925, died in Washington October 26, in his 81st year. His service of nearly 40 years in the Geological Survey, as editorial clerk, assistant editor, and editor, left an enduring monument in the wide reputation for clear, terse expression attained by the published reports of that organization and exerted a far-reaching influence on scientific writing everywhere through his *Suggestions to authors*. This pamphlet, prepared primarily for use in the Geological Survey, proved to contain so much wise counsel of general application that it rapidly became a "best seller" among Government publications. It was first published in 1909 and was revised and enlarged twice. The third edition, issued in 1916, has been reprinted seven times—the latest printing of 1,000 copies in July, 1930—and sent to all parts of the world on request from writers of many classes, teachers of English in universities and colleges, research organizations, and business executives. After his retirement from the Government service Mr. Wood continued to do editorial work, and the demand for his assistance was so great that he worked longer hours than ever. At the time of his death he was editorial reader for the Bulletin of the Geological Society of America and the Arkansas Geological Survey. He wrote most of the articles on the geology of North and South America for the new Encyclopoedia Britannica. He died practically "in harness," having been ill only three days.

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